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ABSTRACT

To examine the child variables which may affect the validity of a screening test in a heterogeneous kindergarten, 64 kindergarten children attending an international school in Taipei, Taiwan, were screened with the Developmental Indicators for the Assessment of Learning - Revised (DIAL-R). Thirty subjects were Caucasian, 21 were Oriental, and 11 had Caucasian-Oriental parentage. Two were not classified by race. Genetic variables (sex, race), environmental variables (years in host country, parental educational level, birth order, size of family, bilingualism of child and parents, birthplace, primary language of child and parents), and the interaction of race and primary language were analyzed to ascertain their effect on the four DIAL-R scores: motor, concepts, language, and total score. The most significant genetic factor was the child's race. The most significant environmental factor was the child's primary language which is affected by parents' language(s). Of the two, language differences appeared to be the overriding factor. Significant differences are discussed. One study finding is that when using an American normed test with a heterogeneous population, local norms are advisable for interpreting the test correctly and meeting the needs of the children tested. (Author/RH)

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Screening Kindergarteners at an International School

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Abstract

Sixty-four kindergarteners at an international school were screened with DIAL-R (Developmental Indicators for the Assessment of Learning-Revised). Genetic variables (sex, race), environmental variables (years in host country, parental educational level, birth order and size of family, bilingualism of child and parents, birthplace, primary language of child and parents), and the interaction of race and primary language of the child were analyzed to ascertain their effect on the four DIAL-R scores. Significant differences are discussed and the conclusion is drawn that when using an American normed test with a heterogeneous population, local norms are advisable for interpreting the test correctly and meeting the needs of the children who were tested.

Screening Kindergarteners at an International School

Screening children in kindergarten for potential problems and/or potential giftedness is a common practice in the United States. The underlying objective for this practice is providing a better match of an educational program with a particular child. Many international schools also employ this practice of screening, or would like to do so, but the diversity of their population makes the selection of an appropriate screening test very difficult.

Although there are hundreds of preschool and kindergarten screening tests (Lerner, Mardell-Czudnowski, & Goldenberg, 1981; Lichtenstein & Ireton, 1984), Meisels (1985) has singled out five tests which meet the essential criteria for developmental screening; one of these five is DIAL, Developmental Indicators for the Assessment of Learning (Mardell & Goldenberg, 1975a, 1975b).

Recently DIAL was revised and restandardized on a national American sample of 2,447 children (Mardell-Czudnowski & Goldenberg, 1983, 1984). DIAL-R has both satisfactory reliability and validity: test-retest reliability (.87); internal consistency (.96); construct validity with age (.98); concurrent validity with the Stanford-Binet (.40). The basic goal of developing DIAL-R was to retain the best elements of DIAL while improving the content, materials, and procedures where such improvements were warranted. The age range was extended six months at each end of the continuum to cover children between the ages of 2-0 and 5-11 and the gross motor and fine motor items were combined into one motor area. Of the 24 items in DIAL-R, 18 are revised from DIAL, 3 are unchanged, and 3 are new. All of the new items and most of the revised items were designed to accommodate the extended age range.

Using a counterbalanced design, 64 kindergarten children in an international day school were each administered DIAL and DIAL-R. Correlations between the two tests were: Motor .30; Concepts .67; Language .77; and Total .75. The first correlation (Motor) was significant at the .05 level while the other three correlations were significant at the .001 level (Mardell-Czudnowski, manuscript in preparation). These results imply that DIAL and DIAL-R are similar enough to expect DIAL-R to have at least the same degree of predictive validity as DIAL, an important characteristic of any screening test. The purpose of this study was to look at the child variables which may affect the validity of a screening test in a heterogeneous kindergarten. To be valid, assessment of children from different cultural backgrounds requires knowledge of the characteristics of the family and cultural group (Garber & Slater, 1983).

Sample

This study was conducted in the kindergartens of an independent coeducational day school which offers a Western-oriented educational program to foreign national students in Taipei, Taiwan. This means that Taiwanese children can attend only if they were born abroad or hold a foreign passport. Classes are conducted in English, most of the faculty are American, but there is an extensive ESL (English as a Second Language) program similar to those found in most large American cities. There were four classes, two in the morning and two in the afternoon, with a total of 64 children.

The sample was very heterogeneous. Table 1 shows where the children were born and the number of years they had lived in Taiwan. Thirty children were Caucasian, 21 were Oriental, and 11 had Caucasian-Oriental parentage. These racial characteristics are shown in Table 2.

Tables 1 and 2 about here

According to school entrance interviews, 40 children (62.5%) were monolingual while 24 children (37.5%) were bilingual. A much larger number of the parents were bilingual: 47 fathers and mothers (73.4%) spoke at least two languages. This is shown in Table 3.

Table 3 about here

There were 41 boys (64%) and 23 girls (36%). The mean age was 66.6 months (SD=4.1) with a range from 59 to 76 months. The educational level of the parents was quite high. Over 84% of the fathers had a college degree (51.6% even had an advanced degree) while 61% of the mothers had a college degree (14.1% even had an advanced degree). In addition, Table 4 indicates the relationship between the position or birth order in the family and the number of children in the family.

Table 4 about here

Method

DIAL-R was administered in one large room by multiple testers, one for each area (Motor, Concepts, Language) of the test. The primary purpose of this arrangement is the establishment of ecological validity, testing children in an environment that resembles the one in which they will be expected to function. Thus, three children were tested simultaneously, typically within 20-30 minutes.

All but two children (twins from Paraguay who only spoke Spanish) were

tested in either English or Chinese, depending upon which language was reported as dominant by their parents. If a tester spoke only English, a kindergarten aide translated the items and the responses of the children who were Chinese dominant. It was assumed that the other eight children whose primary language was of European, Asian, or Middle East origin knew enough English or Chinese as a second language for testing purposes.

Results and Discussion

Table 5 shows the means and standard deviations for DIAL-R scaled scores for the entire sample. The children scored lowest in the Language area and the variability in this area was also the highest. Comparing these scores with the American norms, these scores are considerably higher in Motor, Concepts and Total than the American norms. Since children at this school score, on the average, one or more standard deviations above the norm on most American tests, these results are not unexpected.

Table 5 about here

Each child is born with certain genetic characteristics which interact with environmental influences. These two categories of variables will first be looked at independently.

Genetic Variables

Sex

Table 6 shows the means and standard deviations for DIAL-R scores for boys and girls, both for the entire sample and for those whose primary language was English or Chinese. Although most studies on DIAL-R report no differences between boys and girls (Mardell-Czudnowski & Goldenberg, 1984; Mardell-Czudnowski,

Hwang, & Wang, manuscript in preparation; Mardell-Czudnowski, Dionne-Simard, & Ouellet-Mayrand, manuscript in preparation), there was a significant difference for the entire sample between boys and girls in the Concepts area ($p<.02$) and on the DIAL-R Total score ($p<.03$). When the children whose primary language was neither English or Chinese were removed, there was no longer a significant difference on the DIAL-R Total score, but the girls still performed significantly higher in the Concepts area ($p<.03$). This may be a real difference for this sample or a chance difference based on the fact that when one makes 20 comparisons at the .05 level of confidence, the probability is .95 that one comparison will be significant by chance alone. It is widely recognized that girls generally perform higher than boys in all areas of development at the preschool and kindegarten age levels. However, these differences are usually not significant when measured by DIAL-R.

Table 6 about here

Race

A child's race appears to have an effect on DIAL-R scores. Table 7 shows the means, standard deviations, and t-test statistics for the three groups defined in Table 2. The Eastern children performed significantly higher in the Motor area than the Western children with the West/East children in the middle. In the Concepts area, both the Western children and the West/East children performed significantly higher than the Eastern children, while in the Language area and for the DIAL-R Total, only the West/East children performed significantly higher than the Eastern children.

If one deletes from the analysis those children who were not tested in

their primary language of English or Chinese (N=10), the racial differences become even more pronounced, particularly because seven of the ten deleted were of Westen parentage. The significantly superior motor development of the Eastern children remains but now the Western children score signficantly higher ($p<.001$) than the Eastern children on all of the other three scores (Concepts, Language, Total).

Table 7 about here

Environmental Variables

There were a number of child variables which had no significant effect on any DIAL-R area or Total score. These included the number of years the child lived in Taiwan, mother's or father's educational level, the number of children or birth order in the family, and whether the child was monolingual or bilingual, regardless of the language(s) spoken. For instance, the 25 first-born children, 8 of whom were `only' children, did score higher as a group than the other children but this was not a significant difference.

Birthplace

Table 8 shows the DIAL-R scores according to the child's birthplace. Children born in the U.S. or Canada consistently scored higher than children born anywhere else; these differences reached levels of significance in the Concepts and Language areas and also on the DIAL-R Total score. Where the child was born appears to reflect environmental differences. Parents who live in a particular country at the time when their child is born may be influenced by the customs of that country and this in turn may affect child-rearing practices.

Table 8 about here

Language

Children attending an international school are learning within a multicultural environment as are most children in metropolitan schools. The most outstanding difference between the children is language development as shown in Table 5. This is probably a reflection of the multiple languages to which the children are exposed. Even in monolingual English-speaking homes, the children are most likely in contact with a Chinese-speaking amah (housekeeper) and are exposed to Chinese in the community and on television. In monolingual Chinese-speaking homes, the children have to deal with dialects (e.g. Mandarin, Taiwanese, Cantonese) and may have attended an English preschool. There is a strong desire by most parents who send their children to this school for their children to acquire both English and Chinese, even if the parents speak only one of the languages.

By analyzing the effect of the mother's and father's primary language on the child's DIAL-R scores, it is obvious that both affect the child's performance in the same areas and in the same direction as the child's primary language so only the latter will be reported. Table 9 shows the effect of the child's primary language on DIAL-R scores. The Chinese-speaking children performed significantly higher than the English-speaking children ($p<.03$) in the Motor area, but the English-speaking children performed signficantly better than the Chinese-speaking or children speaking other languages in Concepts ($p<.001$), and DIAL-R Total ($p<.001$).

Since the ten children speaking primary languages other than English or

Chinese were not tested in their own primary language, it is understandable that they scored significantly lower in those areas affected by oral questions or responses. The question is why this was also true of the Chinese-speaking children who were tested in Chinese. Apparently there are other language-related factors which are depressing the scores of the Chinese-speaking children. These factors bias the test results in favor of English-speaking children when the American norms are used. Since DIAL-R has been normed in Chinese in Taiwan (Mardell-Czudnowski, Hwang, & Wang, manuscript in preparation), one way of removing this bias would be to use the Chinese version of DIAL-R with the Chinese-speaking children.

Table 9 about here

Whereas it did not make any difference whether the child was monolingual or bilingual, it did make a difference whether the parents, particularly the mother, were monolingual or bilingual. The Motor scores were never affected, but children whose parents were monolingual performed signficantly higher than children whose parents were bilingual on all other DIAL-R scores. This was most pronounced in the Concepts area. Table 10 shows these differences.

The finding that there was no difference between monolingual and bilingual children on DIAL-R scores is more surprising than the fact that children whose parents were monolingual scored signficantly higher in the Concepts and Language areas than children whose parents were bilingual. The literature abounds with studies which show that bilingualism verse effects on verbal intelligence and English achievement tests (Vernon, 1982). However, the fact that there were no differences between monolingual and bilingual children supports more recent

research findings that balanced bilingualism (proficiency in both languages) can be acquired when both languages are used from the beginning of formal education, subjects are actually taught in the second language, and the second language is used in play activities at least 50% of the time (Vernon, 1982).

Table 10 about here

Interactions between Genetic and Environmental Variables

The most significant genetic factor was the child's race. The most significant environmental factor was the child's primary language which is affected by parents' language(s). Of the 30 Western children, 23 spoke English; of the 21 Eastern children, 2 spoke English; and all 11 West/East children spoke English. Table 11 shows the racial analysis of these English-speaking children on the DIAL-R Total score. This effect occurred on all DIAL-R area scores as well. All racial differences in either direction disappeared; thus, language differences appear to be the overriding factor. Unfortunately, this cannot be confirmed by looking at other languages since no Western or West/East child spoke Chinese as a primary language.

Table 11 about here

Conclusions

According to Garber and Slater (1983), children from varying cultures and subcultures are more similar to each other than different and generally within-group variation exceeds between-group variation. This can be readily substan-

tiated for this sample by Table 11. It appears that we should keep this in mind when selecting and using American normed tests for heterogeneous populations. It is not enough to look at independent child variables. They must be examined in terms of their interactions. This can now be done more readily due to the introduction of computer software programs for a number of tests. Along these lines, DIAL-LOG (Goldenberg, Mardell-Czudnowski, Abrams, & Bushong, 1986) has been developed to provide a means of developing local norms on DIAL-R for any school or district so that children's scores can be more appropriately interpreted and children's needs can be more easily met.

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Table 1

Birth-place and # of Years in Taiwan

	Less than 1	1-2	3 or More	
U.S./Canada	9	9	9	27 42.2%
Taiwan	1	0	7	8 12.5%
Europe	1	3	0	4 6.3%
Asia	2	9	3	14 21.9%
Cent/S. Amer.	2	3	1	6 9.4%
Other	3	1	1	5 7.8%
	18	25	21	64
	28.1%	39.1%	32.8%	100%

Table 2

Racial Characteristics of Sample (N = 62)*

	Caucasian		Oriental	
	N	%	N	%
Parents from same country	24	37.5	13	20.3
Parents from different country	6	9.4	8	12.5
	30	46.9	21	32.8

	N	%
Caucasian-Oriental parentage	11	17.2

* Two children (3.1%) were not classified as their parents were neither from a Western (Caucasian) or Eastern (Oriental) culture (i.e. middle east).

Table 3

Languages of Bilingual Parents (N = 47)

		Primary Language of Father					
		English	Chinese	European	Asian & Other	N	%
Second	English	-	18	9	2	29	61.7
Language	Chinese	6	-	0	1	7	14.9
of	European	5	1	-	0	6	12.8
Father	Asian & Other	4	1	0	-	5	10.6
	N	15	19	10	3	47	
	%	31.9	40.4	21.3	6.4		

		Primary Language of Mother					
		English	Chinese	European	Asian & Other	N	%
Second	English	-	20	9	3	32	68.1
Language	Chinese	2	-	0	1	3	6.4
of	European	5	1	-	2	8	17.0
Mother	Asian & Other	1	3	0	-	4	8.5
	N	8	24	9	6	47	
	%	17.0	51.1	19.1	12.8		

Table 4

Relationship of Position and Number of Children in the Family

# of Children in Family	Position in Family (Birth Order) 1st	2nd	3rd or later	N	%
1	8			8	12.5
2	13	17		30	46.9
3 or more	4	6	16	26	40.7
N	25	23	16	64	
%	39.1	35.9	25.0		100.0

Table 5

Means and Standard Deviations of DIAL-R Scores (N = 64)

	Max. Score	M	S.D.
Motor	(31)	26.3	2.8
Concepts	(31)	25.7	4.0
Language	(31)	23.6	5.9
Total	(93)	75.5	9.8

Table 6

Effect of Sex on DIAL-R Scores

		N	Motor		Concepts		Language		Total	
			M	S.D.	M	S.D.	M	S.D.	M	S.D.
Total	Male	41	26.1	2.9	24.9*	4.4	22.7	6.5	73.6*	10.5
Sample	Female	23	26.7	2.7	27.2*	2.2	25.0	4.2	79.0*	6.9
English	Male	34	26.0	2.8	25.7*	3.4	24.1	5.3	78.8	7.8
or Chinese	Female	20	27.1	2.7	27.5*	2.3	25.0	4.5	79.6	7.2
Speaking										

* $p < .05$

Table 7

Effect of Race on DIAL-R Scores

	Western (N = 30)		Eastern (N = 21)		West/East (N = 11)	
	M	S.D.	M	S.D.	M	S.D.
Motor	25.5	2.7	27.5	2.3	26.4	10.1
Concepts	26.6	4.4	24.3	2.9	26.7	3.1
Language	24.6	6.2	21.7	4.8	26.1	4.3
Total	76.7	10.7	73.5	6.7	79.2	8.2

T-Test Statistics (Two-Tailed)

	Bet. W and E (df = 49)	Bet. W and W/E (df = 39)	Bet. E and W/E (df = 30)
Motor	2.79**	.87	1.16
Concepts	2.06*	.06	2.11*
Language	1.81	.70	2.48*
Total	1.18	.67	2.02*

* $p < .05$

** $p < .01$

Table 8

Effect of Birthplace on DIAL-R Scores

		Motor		Concepts		Language		Total	
	N	M	S.D.	M	S.D.	M	S.D.	M	S.D.
U.S./Canada	27	26.9	2.7	27.2**	3.0	25.3*	4.5	79.3**	6.3
Other	37	25.9	2.8	24.6**	4.2	22.3*	6.5	72.8**	10.7

* $p < .05$

** $p < .01$

Table 9

Effect of Child's Primary Language on DIAL-R Scores

	English (N = 36)		Chinese (N = 18)		Other (N = 10)	
	M	S.D.	M	S.D.	M	S.D.
Motor	25.8	2.9	27.6	2.2	25.6	2.9
Concepts	27.6	2.6	23.8	2.8	22.3	5.6
Language	26.5	3.4	20.2	5.2	18.9	7.7
Total	79.9	6.2	71.6	7.7	66.8	13.4

T-Test Statistics (Two-Tailed)

	Bet. Eng. & Chin. (df = 52)	Bet. Eng. & Other (df = 44)	Bet. Chin. & Other (df = 26)
Motor	2.21*	.22	1.96
Concepts	4.82**	4.16**	.93
Language	5.24**	4.46**	.52
Total	4.20**	4.32**	1.16

* $p < .05$

** $p < .001$

Table 10

Effect of Monolingual and Bilingual Parents on DIAL-R Scores

		Motor		Concepts		Language		Total	
	N	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Monolingual father	17	25.3	2.6	27.7*	2.9	26.7**	3.4	79.1*	7.0
Bilingual father	47	26.6	2.8	25.0*	4.1	22.4**	6.2	74.0*	10.1
Monolingual mother	17	25.9	2.7	28.6***	1.9	26.7**	3.5	81.2**	5.4
Bilingual mother	47	26.4	2.9	24.7***	4.0	22.4**	6.2	73.5**	10.1

* $p < .05$

** $p < .01$

*** $p < .001$

Table 11

Effect of Race on DIAL-R Total Scores for English-Speaking Children (N = 36)

Anova Summary Table

Source of Variation	DF	Sum. of Squares	Mean Squares	F	Significance Level
Between Groups	2	12.774	6.387	0.152	0.860
Within Groups	33	1385.115	41.973		
Total	35	1397.889			

Group Statistics

Group	Codes & Labels	N	Mean	S.D.
Group 1	Western	23	80.391	5.176
Group 2	Eastern	2	79.000	7.071
Group 3	West/East	11	79.182	8.635